

## **REMARKS/ARGUMENTS**

### **Amendments to the Claims**

Basis for the amendment in Claim 10 limiting the structure of the amine (Am) is original Claim 11. No new matter is added.

Please delete original Claim 11.

### **Claim Rejections**

The Examiner has rejected Claims 1 to 21 under 35 U.S.C. 103(a) as being unpatentable over Takeuchi (JP 60006434) in view of Zharov (EP 1029906).

Takeuchi discloses a method to join a fiber-reinforced plastic pipe having a spigot and bell wherein the pipe units are joined vertically by:

1. inserting the spigot part of one pipe into the bell part of the other pipe,
2. after which, an anticorrosion layer is placed so as to cover the lower end of the spigot where it contacts the bell, and
3. after which, an adhesive is injected between the spigot and bell, wherein the adhesive is made of the same resin from which the pipe is made.

The only plastic pipe disclosed in Takeuchi is the one in the working example and it is a glass-fiber-reinforced polyester wherein the adhesive used is an unsaturated polyester adhesive.

Zharov discloses an adhesive useful for bonding low surface energy substrates comprising:

- a. an organoborane amine complex,
- b. an acrylic monomer, and
- c. an acid,

wherein the amine is a primary or secondary amine wherein one of the substituent groups on the nitrogen is either a  $-\text{CH}_2\text{CH}_2\text{OH}$  or  $-(\text{CH}_2)_x\text{NH}_2$  group wherein  $x$  is an integer greater than 2.

Zharov discloses the following type of applications: speaker magnets, metal-metal bonding, automotive glass-metal, glass-glass bonding, circuit board component bonding, selected plastic-metal, glass, wood, etc., and electric motor magnets.

Applicant's present invention is a method for joining a pipe to an object comprising the steps of:

1. applying an adhesive to one or both surfaces to be joined, and
2. after which, joining the pipe to the object,  
wherein the adhesive comprises:
  - a. a boron initiator compound,
  - b. monomers, oligomers, polymers or mixtures thereof having olefinic unsaturation which is capable of polymerization by free radical polymerization, and
  - c. optionally a decomplexing agent.

Takeuchi refers to the adhesives used to join pipe as "resin putty" as well as requiring the adhesive be made of the same resin that is used to make the pipe. This adhesive is presently the most common and widely practice adhesive in the art. The adhesive/putty is the pipe resin dissolved in a solvent. Present methods to join pipe involve the adhesive/putty being applied between the two pipes being joined, the solvent of the adhesive/putty also dissolves some of the pipe resin. As the solvent evaporates, the dissolved resin at the surface of the pipe and the dissolved resin in the adhesive/putty mechanically intertwine to form a physical/mechanical bond. Takeuchi discloses that the adhesive is made from the same resin as the pipe. Takeuchi does not teach or suggest the use of any other kind of adhesive in general, or Applicant's adhesive comprising a boron initiator compound, free radical polymerizable monomers, oligomers, polymers or mixtures thereof having olefinic unsaturation, and optionally a decomplexing agent, in particular. Further, Takeuchi does not teach or suggest that the adhesive comprise a resin different from which the pipe is made.

Zharov discloses adhesive useful for bonding low surface energy substrates comprising an organoborane amine complex, an acrylic monomer, and an acid. However, Zharov neither teaches or suggests using the disclosed adhesive as a replacement for an adhesive/putty made from the same material as the items being bonded (e.g., Takeuchi's adhesive/putty) nor does Zharov teach or suggest using the disclosed adhesive for bonding pipe. There is no motivation what's so ever to combine Takeuchi and Zharov to arrive at Takeuchi's method of joining pipe using Zharov's adhesive.

Even if there was motivation (which Applicant sees none), Takeuchi's method of joining pipe with Zharov's adhesive is not Applicant's present invention. Takeuchi's method requires (1) the pipe to be joined vertically, (2) the two pipes are physically placed together without any adhesive, (3) an anti-corrosion layer placed around the joint of the joined pipe, and (4) an adhesive injected between the two pipes being joined. Applicant's invention differs from Takeuchi's in the following ways: (1) The method of the present invention has no restriction as to the orientation of the pipe being joined. (2) Applicant's method requires the adhesive to be applied to one or both of the surfaces being bonded before they are physically placed together. (3) Applicant does not teach or suggest the use of an anticorrosion layer. (4) The adhesive of the present invention is not injected into anything.

Applicant believes there is no way (not even through hindsight) one skilled in the art could combine Takeuchi and Zharov to arrive at Applicant's present invention of a method for joining a pipe to an object comprising the steps of applying an adhesive to one or both surfaces to be joined after which, joining the pipe to the object, wherein the adhesive comprises: a boron initiator compound; monomers, oligomers, polymers or mixtures thereof having olefinic unsaturation which is capable of polymerization by free radical polymerization; and optionally a decomplexing agent. Applicant further asserts that the present invention as claimed in Claims 1 to 10 and 12 to 21 is unobvious and patentable over Takeuchi in view of Zharov.

With respect to Claims 4 to 9, the Examiners states that one skilled in the art would have recognized the method of Takeuchi as being directed to common plastic materials used in the pipe industry, including polyethylene and polypropylene. However, Takeuchi discloses generally only fiber-reinforced plastic pipes (referred to as FRP) and specifically only glass-fiber-reinforced polyester resin pipe and that both pipes being joined are made from the same glass-fiber-reinforced polyester resin. Further, polyolefin (e.g., polyethylene and polypropylene) pipe is not a common plastic material used in the pipe industry because existing methods of joining such pipe (usually via a thermal process) are cumbersome and expensive requiring specialized equipment. There has been a long felt need for a method to join polyethylene and polypropylene pipe effectively, efficiently, and cost effectively; the present invention meets said long felt need.

Regarding Claim 4, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 4 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest Applicant's pipe made of metal; multilayer plastic; multilayer composite; thermoset; or combinations thereof. Further, these materials are not plastic and/or fiber-reinforced. Further, Applicant's claimed thermoplastic is not fiber-reinforced. Moreover, Takeuchi's method using an adhesive/putty is not relevant when using pipe made of metal; multilayer plastic; multilayer composite; thermoset; or combinations thereof.

Regarding Claim 5, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 5 provides further inventiveness over Takeuchi because, Takeuchi does not teach or suggest Applicant's non-fiber-reinforced thermoplastic pipe.

Regarding Claim 6, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 6 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest Applicant's polyolefin, acrylonitrile, butadiene, and styrene terpolymer; polyvinyl chloride; chlorinated polyvinyl chloride; or blends thereof.

Regarding Claim 7, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 7 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest Applicant's polypropylene. Further, it is well known to one skilled in the art that a polypropylene adhesive/putty such as taught in Takeuchi is not effective for joining polypropylene pipe.

Regarding Claim 8, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 8 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest Applicant's polyethylene. Further, it is well known to one skilled in the art

that a polyethylene adhesive/putty such as taught in Takeuchi is not effective for joining polyethylene pipe.

Regarding Claim 9, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 9 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest that the two pipes being joined are of two different thermoplastic materials.

With respect to Claims 10 to 13, the Examiners states that Zharov includes an organoborane amine complex, wherein the amine component can be a primary diamine or a secondary diamine and that Zharov discloses a wide variety of structures and it would be obvious to one skilled in the art to select Applicant's claimed boron containing initiator compound.

Regarding Claim 10, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 10 provide further inventiveness over Zharov because Zharov does not teach or suggest Applicant's: 10(a i) quaternary substituted organoborate (Zharov only discloses tertiary substituted organoborane compounds); 10(a ii) an internally blocked cyclic borate; 10(a iii) hydroxide/alkoxide organoborane; or 10(a iv) a tertiary organoborane amine complex wherein the amine is not a primary or secondary diamine. Moreover, the amine as claimed in amended Claim 10(a iv) can not comprise either one of the substituent groups (-CH<sub>2</sub>CH<sub>2</sub>OH or -(CH<sub>2</sub>)<sub>x</sub>NH<sub>2</sub>, wherein x is an integer greater than 2) required by Zharov.

Regarding Claim 12, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 12 provide further inventiveness over Zharov because Zharov does not teach or suggest any of the amine compounds as claimed. Moreover, the amine as claimed in Claim 12 can not comprise either one of the substituent groups (-CH<sub>2</sub>CH<sub>2</sub>OH or -(CH<sub>2</sub>)<sub>x</sub>NH<sub>2</sub>, wherein x is an integer greater than 2) required by Zharov.

Regarding Claim 13, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of

Zharov, the limitations to Applicant's invention as claimed in dependent Claim 13 provide further inventiveness over Zharov because Zharov does not teach or suggest either of the silicon containing amine compounds as claimed. Moreover, the amine as claimed in Claim 13 can not comprise either one of the substituent groups (-CH<sub>2</sub>CH<sub>2</sub>OH or -(CH<sub>2</sub>)<sub>x</sub>NH<sub>2</sub>, wherein x is an integer greater than 2) required by Zharov.

Regarding Claim 15, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 15 is further distinguished over Zharov because Zharov does not teach or suggest any of the Applicant's following additional components: one or more unpolymerized or partially polymerized compound having ring opening heterocyclic moieties and optionally a Lewis acid catalyst capable of initiating polymerization of the compound containing heterocyclic moieties; one or more compound, oligomer or prepolymer having siloxane groups and reactive moieties in its backbone capable of polymerization; one or more compound, oligomer or prepolymer having siloxane groups in its backbone which contain a moiety which when exposed to moisture forms an acid capable of decomplexing the organoborane amine complex; or mixtures thereof.

Regarding Claims 17 to 19, the Examiner states that Takeuchi's method comprises application of an adhesive in a uniform gap (T-7) between the spigot and the bell.

Regarding Claim 18, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 18 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest that the gap (T-7) be uniform.

Regarding Claim 19, in addition to the arguments hereinabove regarding the inventiveness of Applicant's present invention over Takeuchi in view of Zharov, the limitations to Applicant's invention as claimed in dependent Claim 19 provides further inventiveness over Takeuchi because Takeuchi does not teach or suggest Applicant's channel in the bell (12)-a channel is not the same as the gap

disclosed in Takeuchi (T-7), alignment guides (20), guide ring (25), mesh collar (30), a gasket (40), a serrated washer (50), or combinations thereof.

The Examiner has rejected Claim 22 under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi (JP 11311392) and further in view of Zharov.

Yamaguchi discloses a method to repair a pipe comprising the steps of:

1. preparing a repair sheet having one surface covered with a pressure-sensitive adhesive, wherein said adhesive consists of a synthetic resin adhesive, e.g., a butyl rubber adhesive;
2. covering said pressure-sensitive adhesive is covered by a protective film;
3. removing the film;
4. placing the pressure-sensitive adhesive side of the repair sheet against the place on the pipe to be repaired; and
5. pressure-adhering the repair sheet to the pipe.

Zharov discloses an adhesive useful for bonding low surface energy substrates comprising:

- a. an organoborane amine complex,
- b. an acrylic monomer, and
- c. an acid,

wherein the amine is a primary or secondary amine wherein one of the substituent groups on the nitrogen is either a  $-\text{CH}_2\text{CH}_2\text{OH}$  or  $-(\text{CH}_2)_x\text{NH}_2$  group wherein  $x$  is an integer greater than 2.

Zharov discloses the following type of applications: speaker magnets, metal-metal bonding, automotive glass-metal, glass-glass bonding, circuit board component bonding, selected plastic-metal, glass, wood, etc., and electric motor magnets.

Applicant's method to repair a new or existing pipe, object, or pipe/object joint having one or more surface in need of repair comprising the steps of

1. applying an effective amount of a curable one or two part adhesive composition to the surface(s) in need of repair, wherein the adhesive comprises:
  - a. a boron initiator compound,

- b. monomers, oligomers, polymers or mixtures thereof having olefinic unsaturation which is capable of polymerization by free radical polymerization, and
- c. optionally a decomplexing agent and

2. bonding a repair patch to the surface in need of repair.

Yamaguchi discloses only a butyl rubber adhesive. Yamaguchi neither teaches nor suggests using an organoborane amine complex, an acrylic monomer, and an acid. Zharov discloses an organoborane amine complex, an acrylic monomer, and an acid. However, Zharov neither teaches nor suggests using the disclosed adhesive as an alternative for a butyl rubber adhesive or as a pressure-sensitive adhesive nor does Zharov teach or suggest using the disclosed adhesive for repairing pipe. There is no motivation to combine Yamaguchi and Zharov to arrive at Yamaguchi's method of repairing pipe using Zharov's adhesive.

Further, even if there was motivation (which Applicant does not believe there is) to combine Yamaguchi and Zharov to arrive at Yamaguchi's method of repairing pipe using Zharov's adhesive, Yamaguchi's method differs from Applicant's method because:

1. Applicant's method does not utilize a pressure-sensitive adhesive;
2. Applicant's invention does not utilize a protective film between repair patch and surface in need of repair; and
3. Applicant's method does not require pressure to adhere the repair patch.

From a practical standpoint, using Zharov's adhesive in Yamaguchi's method would not work. Once Zharov's adhesive was applied to Yamaguchi's sheet and covered with a protective film, the sheet would be bonded to the film. The film could not be removed and, if it could, the adhesive would have cured and would not bond to the pipe surface to be repaired. Applicant asserts that the present invention as claimed in Claim 22 is nonobvious and patentable over Yamaguchi in view of Zharov.

The Examiner did not rely upon Rodrigo (GB 2003243); however he noted it as pertinent. To be thorough, Applicant will address Rodrigo. Rodrigo discloses a method to bond an insert into the bell end of a pipe wherein the insert is optionally held in place by a bonding material (e.g., an acrylic adhesive or

flexibilized polyvinyl chloride) and then heat is applied, either by use of induction coils or by friction occasioned by relative rotation between the insert and the pipe, to physically join the pipe to the insert. Rodrigo's optional use of bonding material between the pipe and insert is used only to hold the insert in proper alignment for the application of heat to join the pipe to the insert. The only means of bonding the pipe to the insert disclosed by Rodrigo is by the application of heat. Rodrigo's method of joining a pipe to an insert is complicated requiring an electromagnetic bonding composition and/or a complex spin-bonding apparatus and/or heating the pipe on a specially designed mandrel. Rodrigo's method requires heat for bonding the pipe and the insert, there is no teaching, suggestion, or motivation to an alternative bonding solution. Applicant asserts that Rodrigo is not relevant to the present invention.

## CONCLUSIONS

In view of the preceding amendments and remarks, Applicant believes all grounds of rejection have been fully traversed and Applicant's Amended Claim 10 and original Claims 1 to 9 and 12 to 22 are patentable in full. Accordingly, their reconsideration and allowance at the earliest possible convenience is courteously solicited.

Respectfully submitted,

  
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